



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

UC-NRLF



\$B 280 100

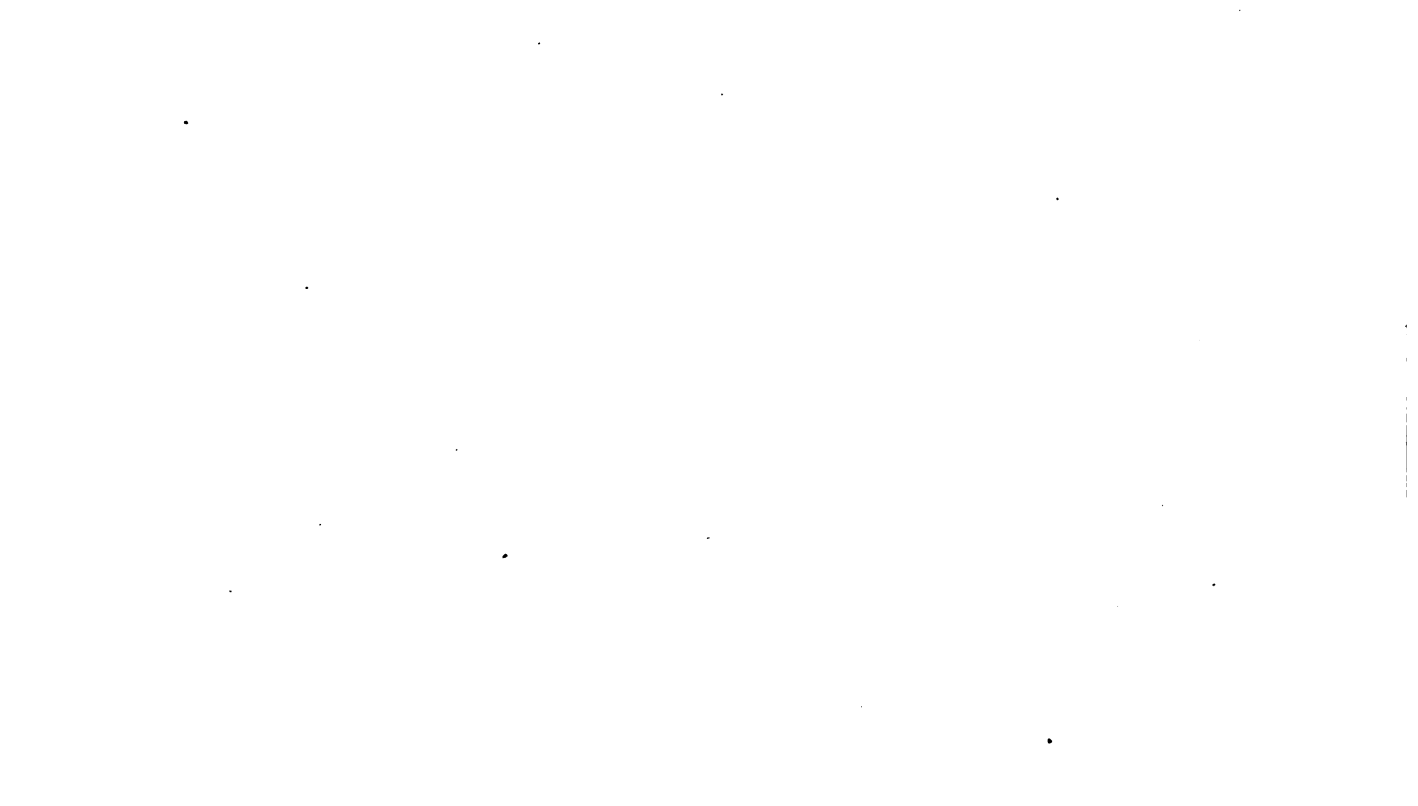
YA 06820

LIBRARY
OF THE
UNIVERSITY OF CALIFORNIA.

Class







TABLES AND DIAGRAMS

FOR FACILITATING THE MAKING OF

ESTIMATES FOR SEWERAGE WORK

By S. M. SWAAB, C.E.

GENEVA

NEW YORK:
THE ENGINEERING NEWS PUBLISHING COMPANY.
1902.





TABLES AND DIAGRAMS FOR FACILITATING THE COMPUTATION OF ESTIMATES FOR SEWERAGE WORK.

By S. M. SWAAB, Civil Engineer, Philadelphia, Pa.

The object of the accompanying tables and diagrams, as the title suggests, is to facilitate the computation of estimates for sewerage work. The figures represent in the case of masonry the gross amount of brick and mortar and stone and mortar which comprise the brick masonry and stone masonry indicated by the tables.

The quantity of mortar in brick masonry amounts to about 25 to 30% of the total bulk, and the quantity of mortar in stone masonry amounts to about 32 to 35%. Five hundred bricks, more or less, of standard size are required to lay a cubic yard of brick masonry where the joints are from $\frac{1}{4}$ to $\frac{3}{8}$ -in. thick. About 2% should be allowed for breakage and cutting.

The quantities of excavation indicated by the diagrams are the minimum quantities which will allow the trench to be as wide from top to bottom as the greatest external width of the "cradle." The quantities of excavation for sewers not in "masonry cradle" refer to a trench equal in width at the top to the greatest external width of the sewer, and at the bottom to conform to the shape of the section.

Allowance has been made in all the diagrams so that the quantities indicated thereon represent the total amount of excavation to the "outside bottom" of the sewer; but as the figures representing the depth of the sewer below grade are invariably given on the "inside bottom" of the



sewer, the depth, in these diagrams, for convenience, is also given to the "inside bottom."

Method of Using the Diagrams.

The internal dimensions in feet and inches of the egg shape and circular sewers will be found on the left of the diagrams in every case. Run over this line toward the right until the curve is found representing the depth to the inside bottom of the sewer below the surface; then follow down the vertical line which intersects the curve at this point to the bottom of the diagram, on which may be read off at once the quantity of excavation.

All the quantities given in the tables and diagrams are in cubic yards and decimals of a cubic yard per linear foot of sewer. The quantities given in the tables have merely to be multiplied by the length of the sewer to find the

total amount of brick or stone masonry, excavation, etc., in any given piece of work.

The following examples will illustrate the method of using the tables and diagrams:

Example 1.—Given a 3-ft. diameter circular sewer in "full cradle," 1,000 ft. long, 12 ft. deep to inside bottom:
From Plate I.:

Quantity of brickwork =	—	0.292	cu.yds. per lin.ft.
		<u>1,000</u>	
Total " "		292	cu. yds. per 1,000 ft.

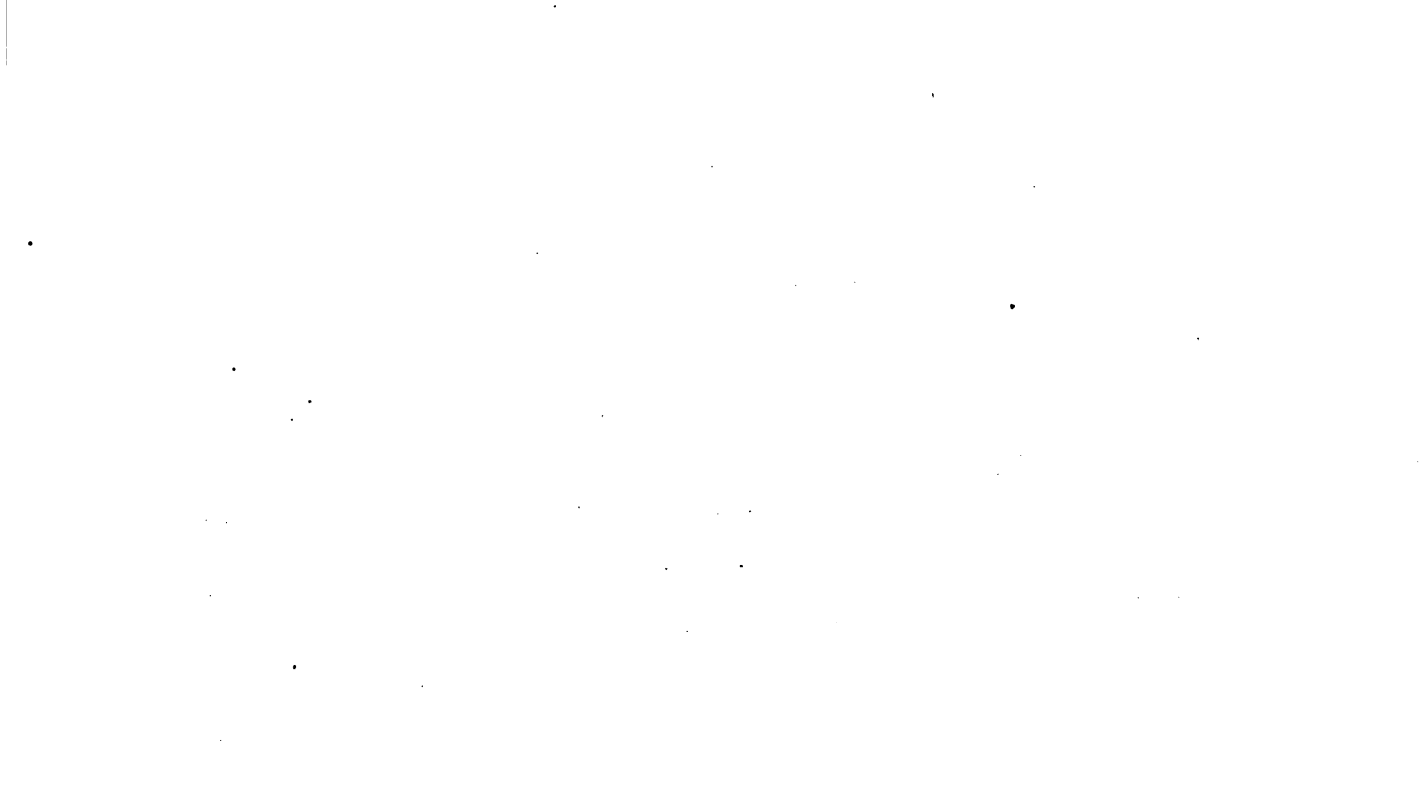
From Plate I.:

Quantity of masonry =	—	0.48	cu.yds. per lin.ft.
		<u>1,000</u>	
Total " "		480	cu. yds. per 1,000 ft.

From Plate VII.:

Quantity of excavation =	—	3.54	cu.yds. per lin.ft.
		<u>1,000</u>	
Total " "		3,540	cu. yds. per 1,000 ft.

Example 2.—Given an 8-ft. diameter circular sewer in "partial cradle" 1,000 ft. long, 18 ft. deep to inside bottom:



From Plate II.:

$$\text{Quantity of brickwork} = -\frac{1.14}{1,000} \text{ cu.yds. per lin.ft.}$$

$$\text{Total " " } = \frac{1,140}{1,000} \text{ cu. yds. per 1,000 ft.}$$

From Plate II.:

$$\text{Quantity of masonry} = -\frac{1.414}{1,000} \text{ cu.yds. per lin.ft.}$$

$$\text{Total " " } = \frac{1,414}{1,000} \text{ cu. yds. per 1,000 ft.}$$

From Plate XII.:

$$\text{Quantity of excavation} = -\frac{9.4}{1,000} \text{ cu.yds. per lin.ft.}$$

$$\text{Total " " } = \frac{9,400}{1,000} \text{ cu. yds. per 1,000 ft.}$$

Example 3.—Given a 2-ft. 2-in. \times 3-ft. 3-in. egg-shape sewer in "full cradle," 1,000 ft. long, 10 ft. deep to inside bottom:

From Plate IV.:

$$\text{Quantity of brickwork} = -\frac{0.25}{1,000} \text{ cu.yds. per lin.ft.}$$

$$\text{Total " " } = \frac{250}{1,000} \text{ cu. yds. per 1,000 ft.}$$

From Plate IV.:

$$\text{Quantity of masonry} = -\frac{0.50}{1,000} \text{ cu.yds. per lin.ft.}$$

$$\text{Total " " } = \frac{500}{1,000} \text{ cu. yds. per 1,000 ft.}$$

From Plate XVI.:

$$\text{Quantity of excavation} = -\frac{2.58}{1,000} \text{ cu.yds. per lin.ft.}$$

$$\text{Total " " } = \frac{2,580}{1,000} \text{ cu. yds. per 1,000 ft.}$$

Example 4.—Given a 4-ft. 6-in. diameter circular sewer, 9-in. brickwork (double ring of brick all around), 1,000 ft. long, 9 ft. 6 ins. deep to inside bottom.

From Plate I.:

$$\text{Quantity of brickwork} = -\frac{0.458}{1,000} \text{ cu.yds. per lin.ft.}$$

$$\text{Total " " } = \frac{458}{1,000} \text{ cu. yds. per 1,000 ft.}$$

From Plate VI.:

$$\text{Quantity of excavation} = -\frac{2.15}{1,000} \text{ cu.yds. per lin.ft.}$$

$$\text{Total " " } = \frac{2,150}{1,000} \text{ cu. yds. per 1,000 ft.}$$



For quantity of excavation in rock, where the arch, haunch and counterarch are used without masonry cradle, read the quantity of excavation for the given size and depth from the diagram showing the quantity of excavation for circular sewer in partial cradle in cubic yards; next find the quantity of masonry required for the sewer in partial cradle in cubic yards; subtract the latter from the former, and the result is the total amount of rock excavation.

Example 5.—Given a 10-ft. diameter sewer in "rock excavation" 17 ft. to inside bottom.

From Plate XIII.....	10.7 cu. yds. excav. per lin. ft.
From Plate II.....	1.9 " " masonry.
	<u>8.8</u> " " rock excavation.

An infinite number of combinations of the various tables and diagrams will suggest themselves as occasion demands. The tables and diagrams are applicable to all combinations where the general "dimensions and design" of the sewer sections compare favorably with the dimensions of the sections on which these tables were based, as shown by the headings of the different tables.



Circular Sewers					
Size	Brick Masonry Six inch Arched and Half round	Rubble Masonry Full Circle Six inch thick under Ground at surface	Rubble Masonry Partial Circle Six inch thick under ground at surface	Brick Masonry	
				4 inch Brick ring all around	Six inch Brick ring all around
Ft. In.	Quantity in cubic yards pr. linear foot				
2 0	0.227	0.3		0.103	0.24
3	.236	.33		.114	.261
6	.244	.35		.125	.284
9	.270	.43		.136	.3
3 0	.292	.46		.147	.327
3	.320	.54		.158	.35
6	.346	.59		.169	.37
9	.360	.65		.18	.39
4 0	.38	.7		.19	.41
3	.40	.74		.20	.436
6	.42	.78		.21	.458
9	.45	.85		.223	.46
5 0	.49	.90	0.74	0.234	0.50
3	.54	0.96	0.80		
6	.57	1.03	0.87		
9	0.60	1.07	0.93		



LIBRARY
OF THE
UNIVERSITY
OF CALIFORNIA

Circular Sewers			
Size	Brick Masonry 13 in. Arch, Hand and 9 inch course arch	Rubble Masonry 11 in Full Course 12 inches thick under course arch at centre	Rubble Masonry 11 in Full Course 12 inches thick under course arch at centre
Ft. 1n.	Quantity in cubic yards per linear foot.		
6.....0	0.885	1.33	1.0
3	0.9	1.40	1.06
6	0.927	1.40	1.1
9	0.975	1.53	1.16
7.....0	1.0	1.57	1.2
3	1.04	1.60	1.29
6	1.06	1.66	1.33
9	1.1	1.76	1.375
8.....0	1.14	1.84	1.414
3	1.175	1.93	1.47
6	1.21	2.0	1.52
9	1.25	2.1	1.58
9.....0	1.28	2.2	1.63
3	1.32	2.27	1.7
6	1.35	2.35	1.77
9	1.39	2.43	1.84
10.....0	1.43	2.51	1.90
3	1.46	2.60	2.0
6	1.50	2.72	2.10
9	1.53	2.86	2.20
11.....0	1.57	3.0	2.33
3	1.60	3.1	2.40
6	1.63	3.2	2.50
9	1.675	3.35	2.60
12.....0	1.70	3.45	2.66



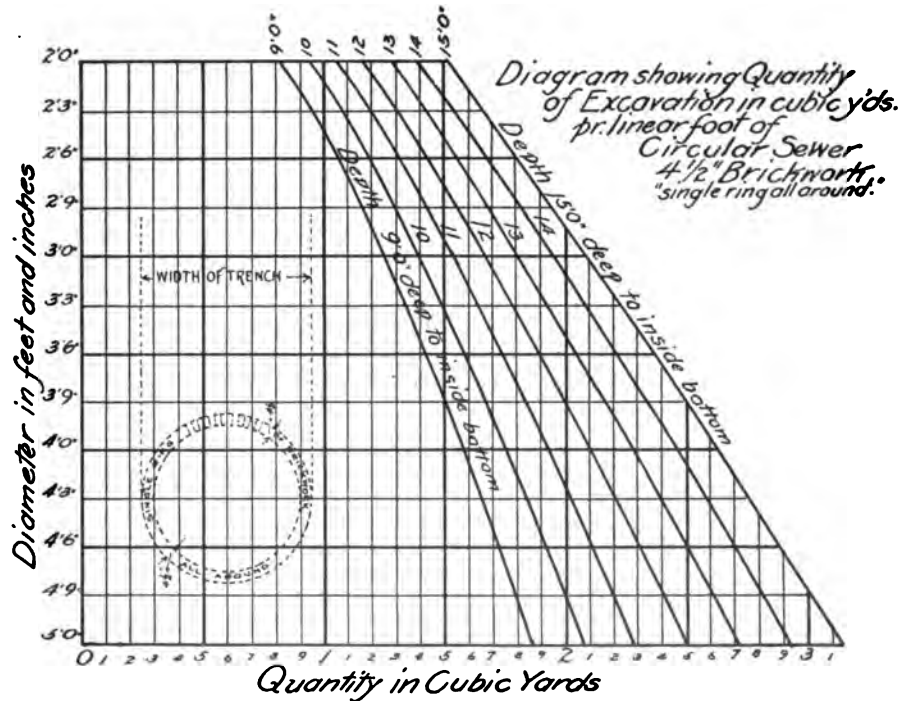
<i>Circular Sewers</i>				
<i>Size</i>	<i>Brick Masonry</i>		<i>Rubble Masonry</i>	
	<i>18 in. Arch, Haunch and 9 inch counterarch</i>		<i>12 inches thick under counterarch at centre In Full Cradle In Partial Cradle</i>	
<i>Ft.</i>	<i>In.</i>	<i>Quantity in cubic yards pr. linear foot.</i>		
<i>12.....</i>	<i>0</i>	<i>1.75</i>	<i>3.45</i>	<i>2.66</i>
	<i>3</i>	<i>1.82</i>	<i>3.50</i>	<i>2.72</i>
	<i>6</i>	<i>1.9</i>	<i>3.58</i>	<i>2.76</i>
	<i>9</i>	<i>2.0</i>	<i>3.70</i>	<i>2.84</i>
<i>13.....</i>	<i>0</i>	<i>2.1</i>	<i>3.75</i>	<i>2.91</i>
	<i>3</i>	<i>2.12</i>	<i>3.85</i>	<i>2.97</i>
	<i>6</i>	<i>2.25</i>	<i>3.90</i>	<i>3.06</i>
	<i>9</i>	<i>2.31</i>	<i>3.95</i>	<i>3.14</i>
<i>14.....</i>	<i>0</i>	<i>2.40</i>	<i>4.22</i>	<i>3.23</i>
	<i>3</i>	<i>2.50</i>	<i>4.4</i>	<i>3.36</i>
	<i>6</i>	<i>2.60</i>	<i>4.6</i>	<i>3.5</i>
	<i>9</i>	<i>2.65</i>	<i>4.75</i>	<i>3.70</i>
<i>15.....</i>	<i>0</i>	<i>2.75</i>	<i>5.03</i>	<i>3.90</i>



<i>Egg Shape Sewers (FRANCH SECTION)</i>				
<i>Size</i>	<i>Brick Masonry 9 in. Arch, haunch 8-4 1/2 in. cours & arch</i>	<i>Full circular Masonry 9 in. thick haunch cours & arch at center.</i>	<i>Brick Masonry</i>	
			<i>single ring of brick 4 1/2 in. thick</i>	<i>double ring of brick 9 in. thick</i>
<i>Quantity in cubic yards pr. linear foot.</i>				
<i>1'6" x 2'3"</i>	<i>0.2</i>	<i>0.35</i>	<i>0.099</i>	<i>0.231</i>
<i>1'8" x 2'6"</i>	<i>0.214</i>	<i>0.37</i>	<i>0.108</i>	<i>0.249</i>
<i>1'10" x 2'9"</i>	<i>0.228</i>	<i>0.42</i>	<i>0.117</i>	<i>0.267</i>
<i>2'0" x 3'0"</i>	<i>0.237</i>	<i>0.44</i>	<i>0.126</i>	<i>0.286</i>
<i>2'2" x 3'3"</i>	<i>0.25</i>	<i>0.50</i>	<i>0.136</i>	<i>0.304</i>
<i>2'4" x 3'6"</i>	<i>0.266</i>	<i>0.56</i>	<i>0.144</i>	<i>0.321</i>
<i>2'6" x 3'9"</i>	<i>0.28</i>	<i>0.61</i>	<i>0.154</i>	<i>0.34</i>
<i>2'8" x 4'0"</i>	<i>0.288</i>	<i>0.63</i>	<i>0.163</i>	<i>0.359</i>
<i>2'10" x 4'3"</i>	<i>0.31</i>	<i>0.71</i>	<i>0.172</i>	<i>0.376</i>
<i>3'0" x 4'6"</i>	<i>0.32</i>	<i>0.81</i>	<i>0.181</i>	<i>0.39</i>
<i>3'2" x 4'9"</i>	<i>0.335</i>	<i>0.875</i>	<i>0.190</i>	<i>0.41</i>
<i>3'4" x 5'0"</i>	<i>0.352</i>	<i>0.981</i>	<i>0.20</i>	<i>0.432</i>

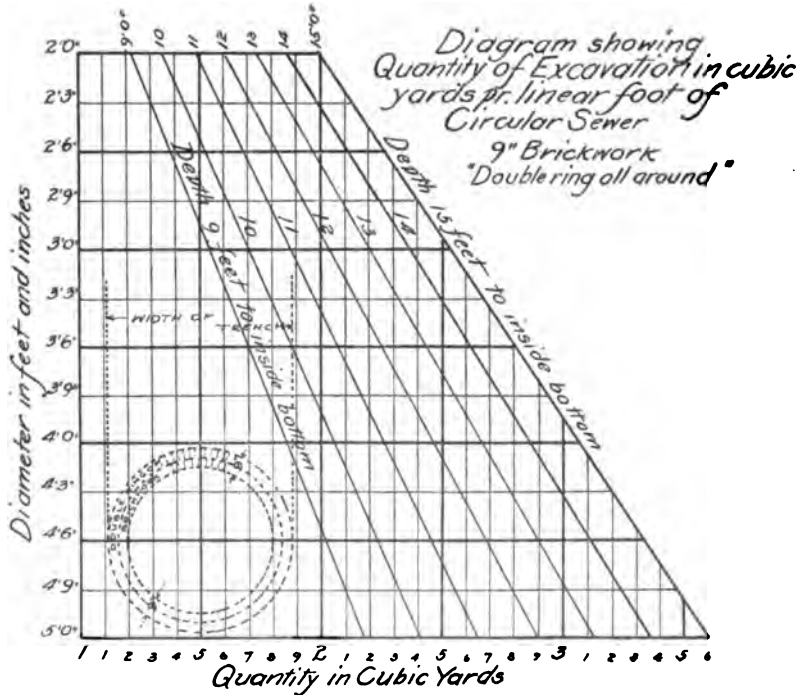


LIBRARY
OF THE
UNIVERSITY
OF
CALIFORNIA





LIBRARY
OF THE
UNIVERSITY
OF
CALIFORNIA





LIBRARY
OF THE
UNIVERSITY
OF
CALIFORNIA

Table showing Quantity of Excavation in cubic yds.
 for linear foot of Circular Sewer in Full Cradle.

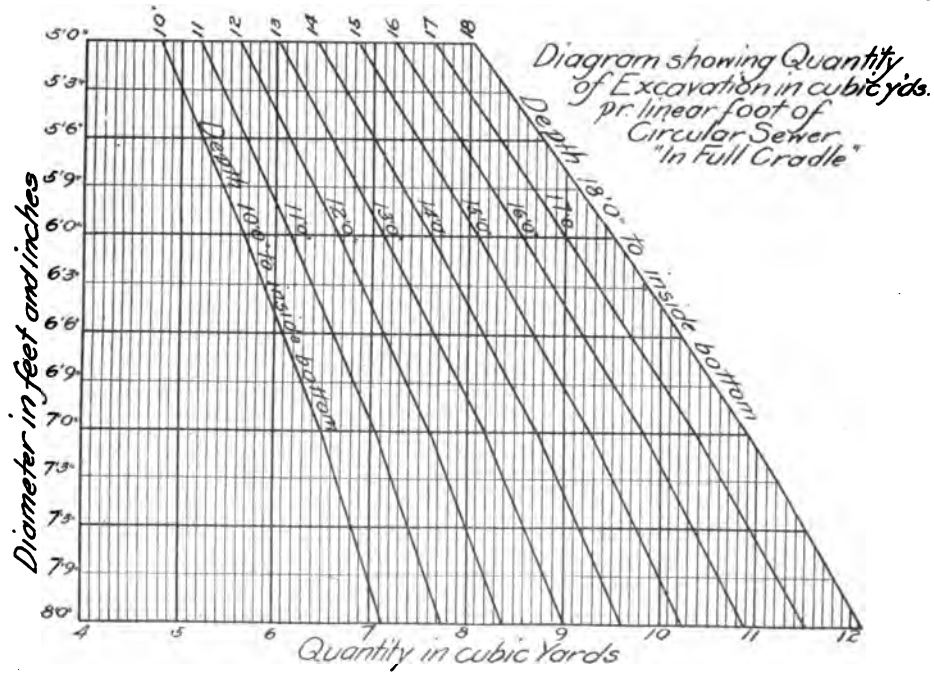
Diameter Diameter	Depth to inside bottom of sewer, in feet						
	10'	11'	12'	13'	14'	15'	16'
2-0	2.3	2.63	2.71	2.92	3.13	3.34	3.54
2-3	2.43	2.65	2.76	3.13	3.27	3.5	3.72
2-6	2.56	2.76	3.01	3.23	3.5	3.71	3.94
2-9	2.6	3.06	3.25	3.4	3.75	4.0	4.26
3-0	3.0	3.29	3.64	3.8	4.07	4.36	4.62
3-3	3.17	3.5	3.75	4.12	4.38	4.62	4.9
3-6	3.42	3.78	4.0	4.37	4.9	4.97	5.3
3-9	3.6	3.9	4.23	4.4	4.9	5.2	5.52
4-0	3.78	4.12	4.46	4.8	5.13	5.47	5.82
4-3	3.95	4.18	4.60	4.85	5.2	5.58	5.9
4-6	3.89	4.24	4.59	4.9	5.3	5.67	6.0
4-9	3.96	4.32	4.68	5.0	5.4	5.76	6.11

WIDTH OF TRENCH

Quantity in cubic yards

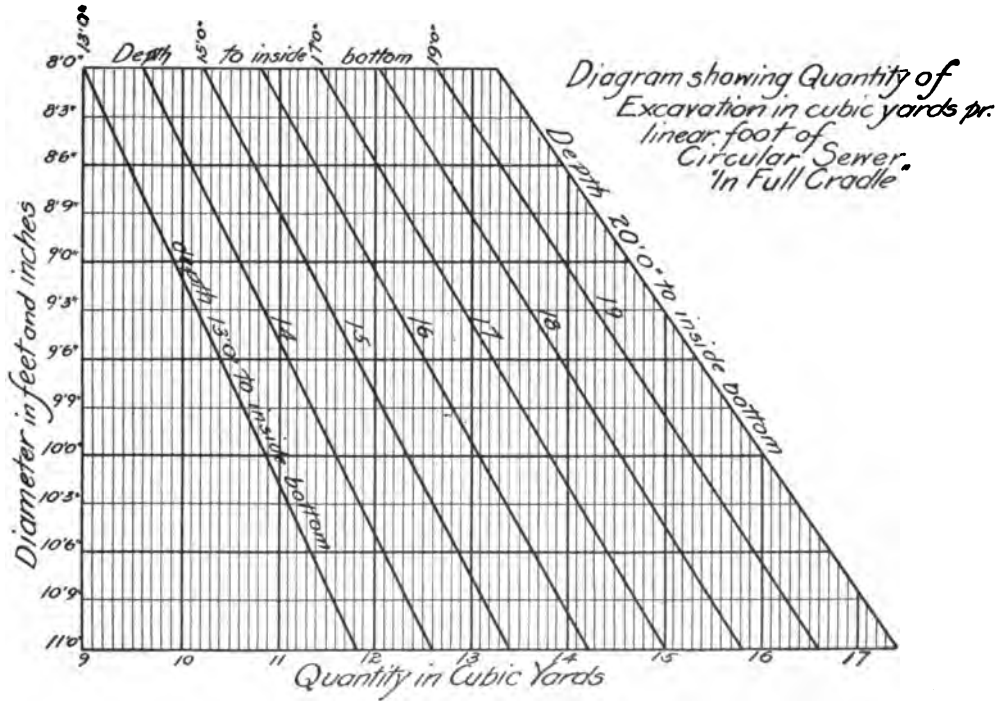


LIBRARY
OF THE
UNIVERSITY
of
CALIFORNIA

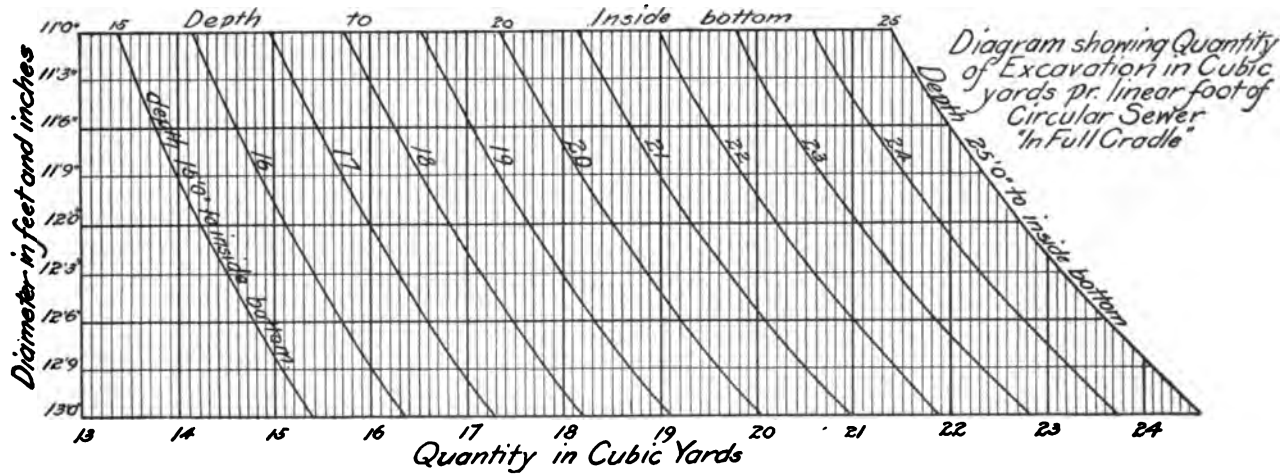




LIBRARY
OF THE
UNIVERSITY
OF
CALIFORNIA

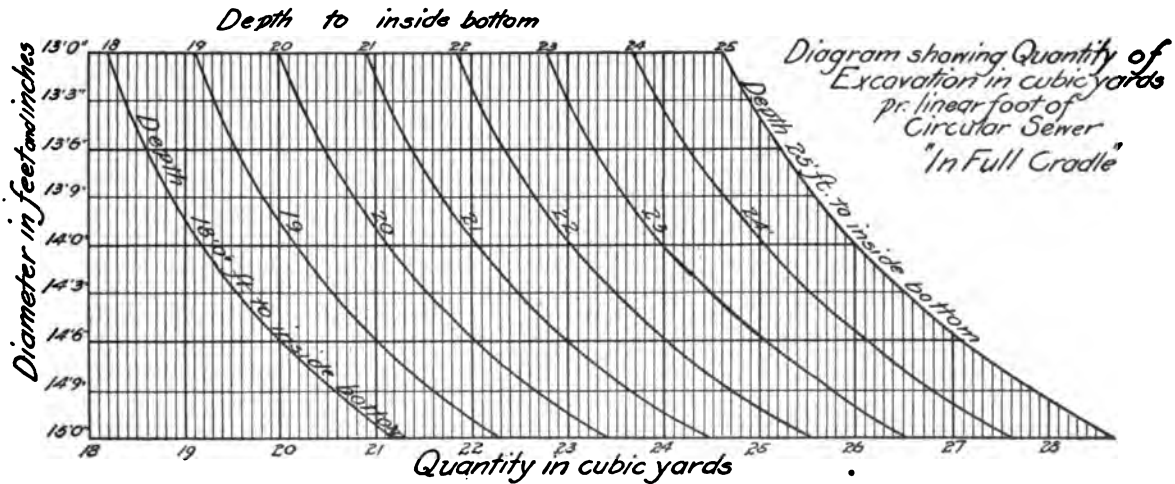




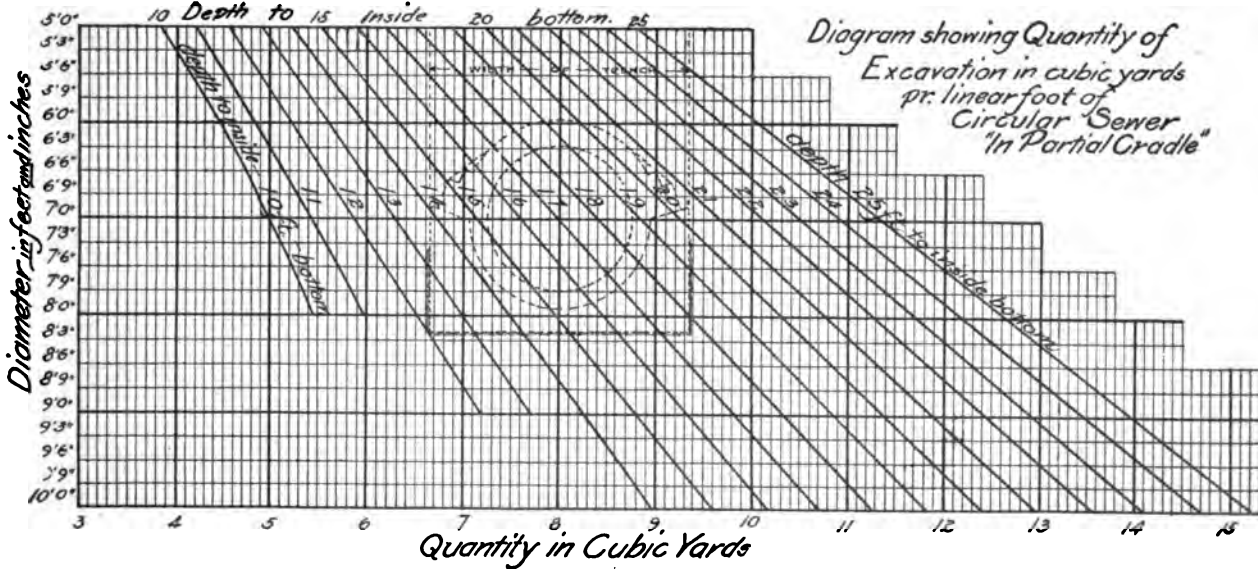




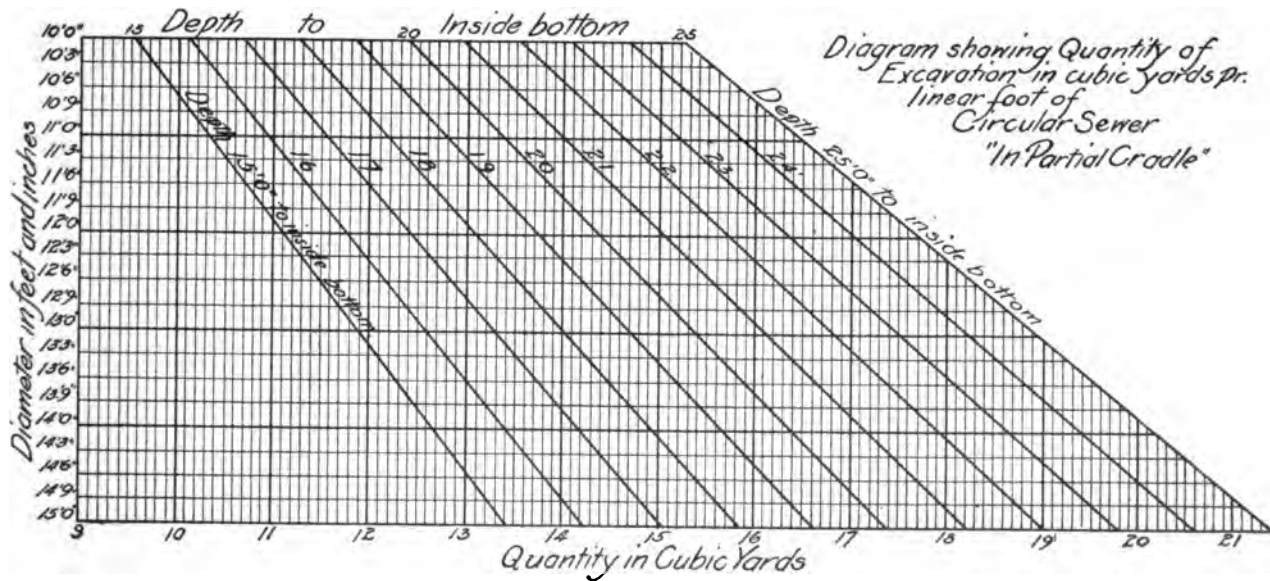
LIBRARY
OF THE
UNIVERSITY
OF
CALIFORNIA



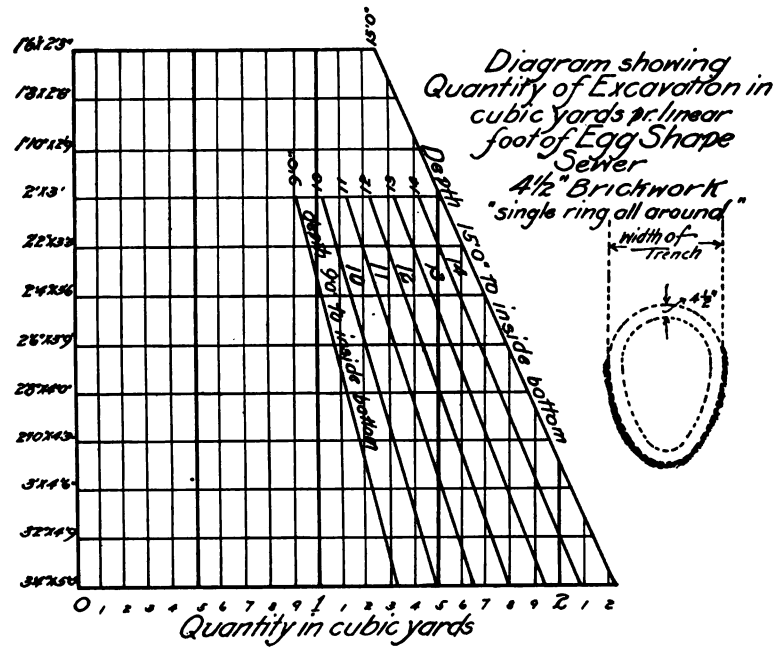
LIBRARY
OF THE
UNIVERSITY
OF
CALIFORNIA





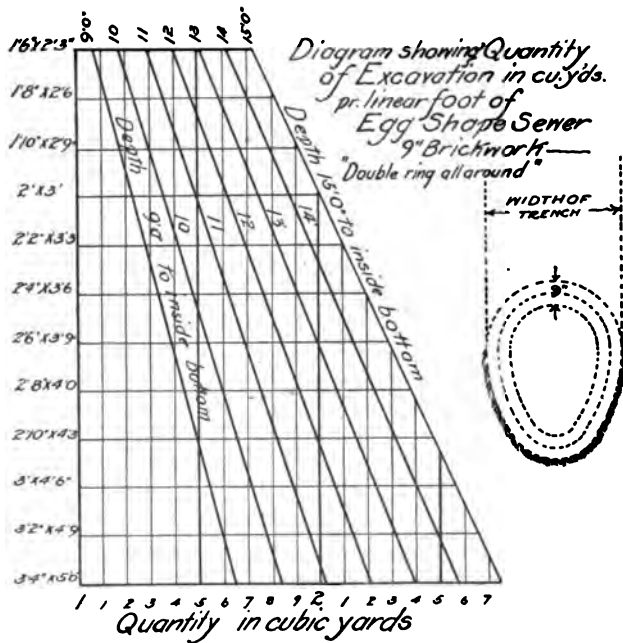






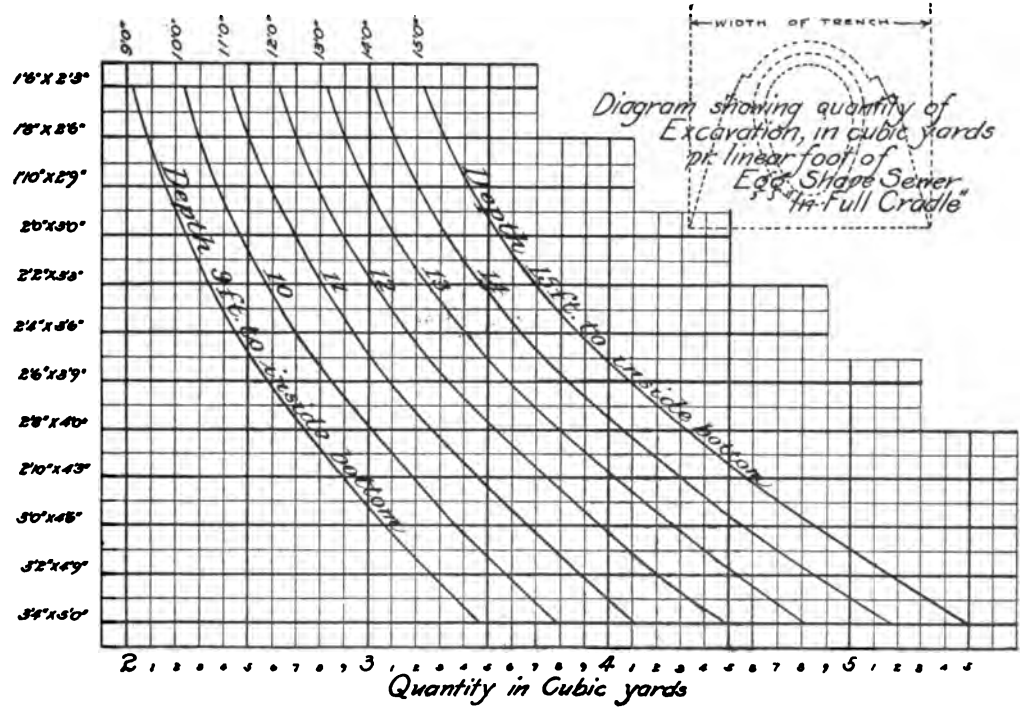


LIBRARY
OF THE
UNIVERSITY
OF
CALIFORNIA



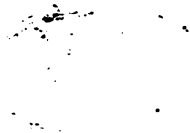


LIBRARY
OF THE
UNIVERSITY
OF
CALIFORNIA





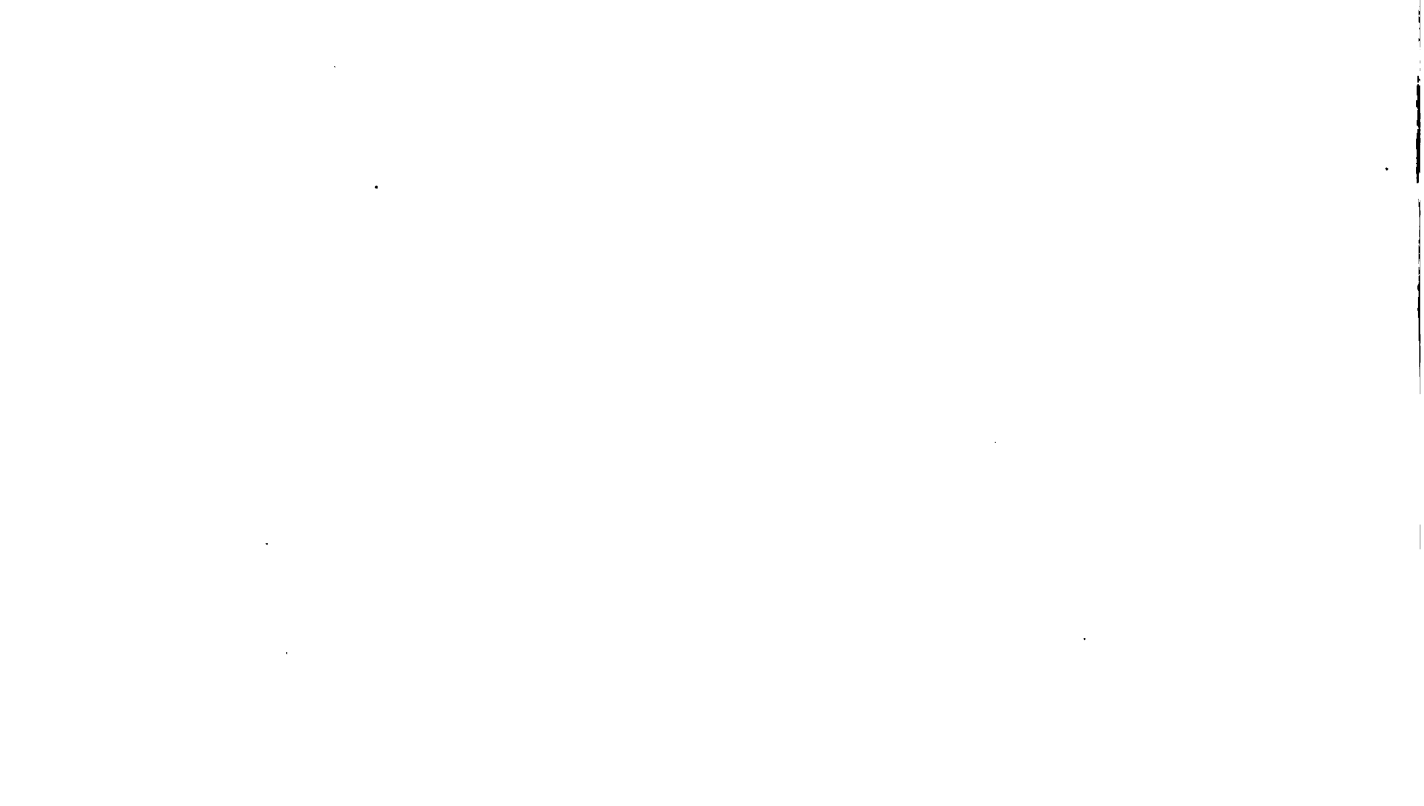
LIBRARY
OF THE
UNIVERSITY
OF
CALIFORNIA

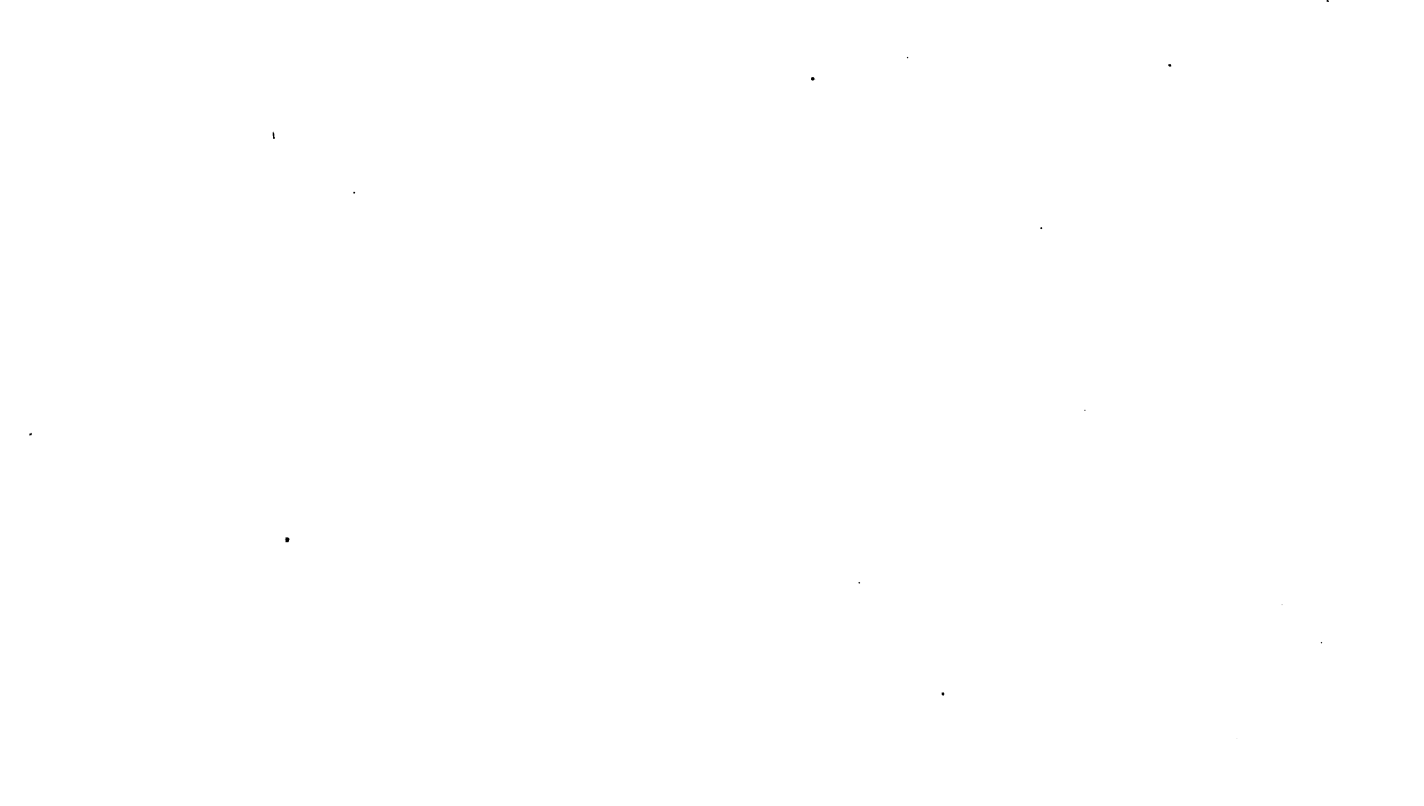


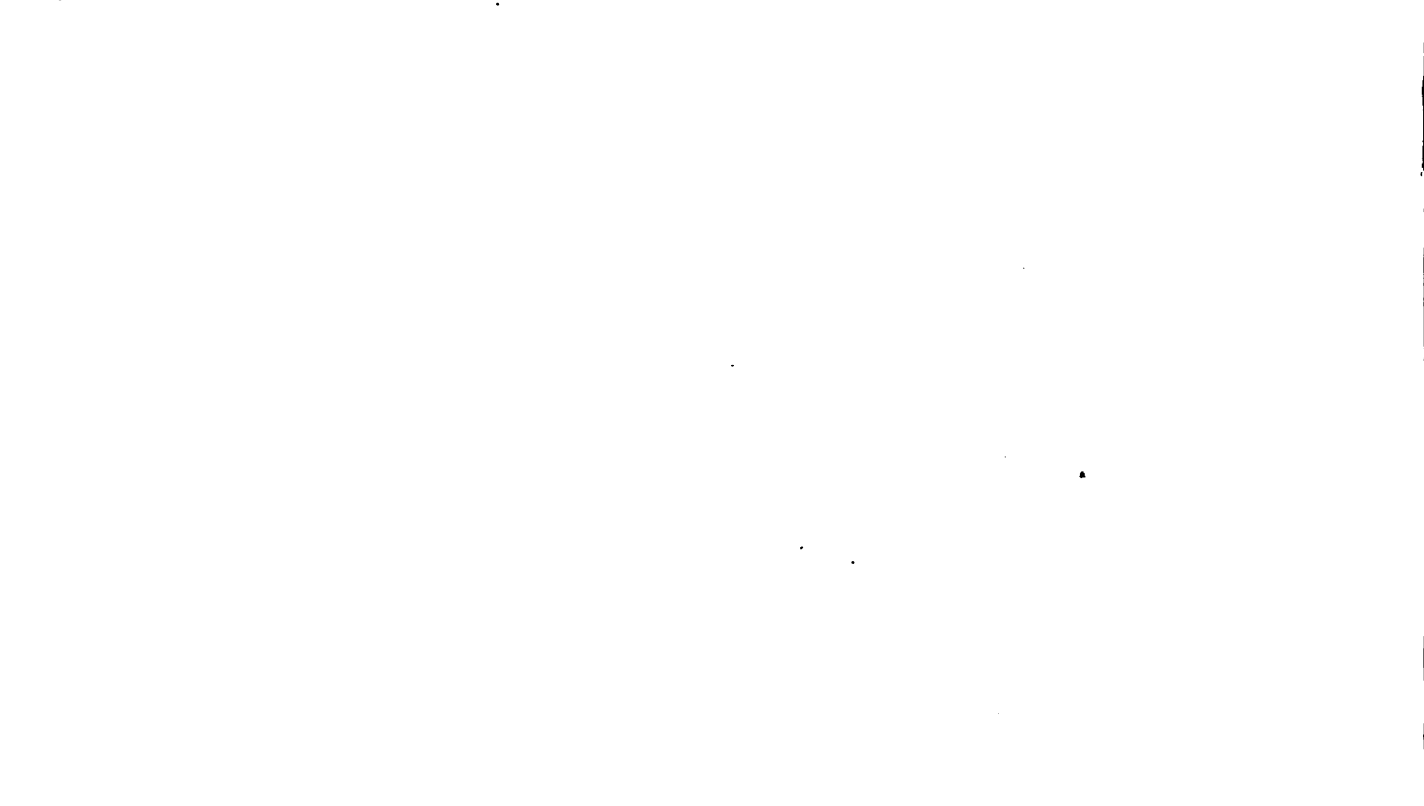
















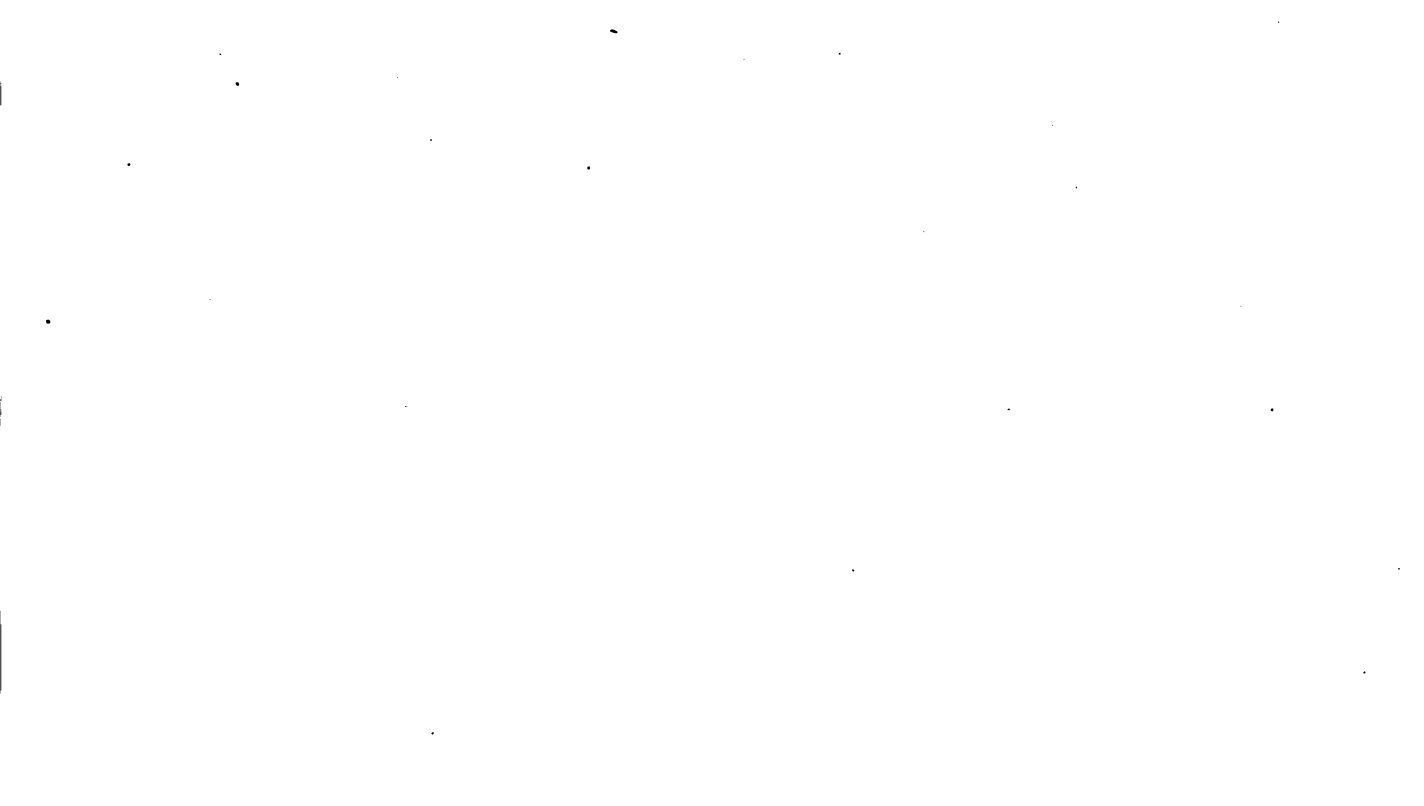












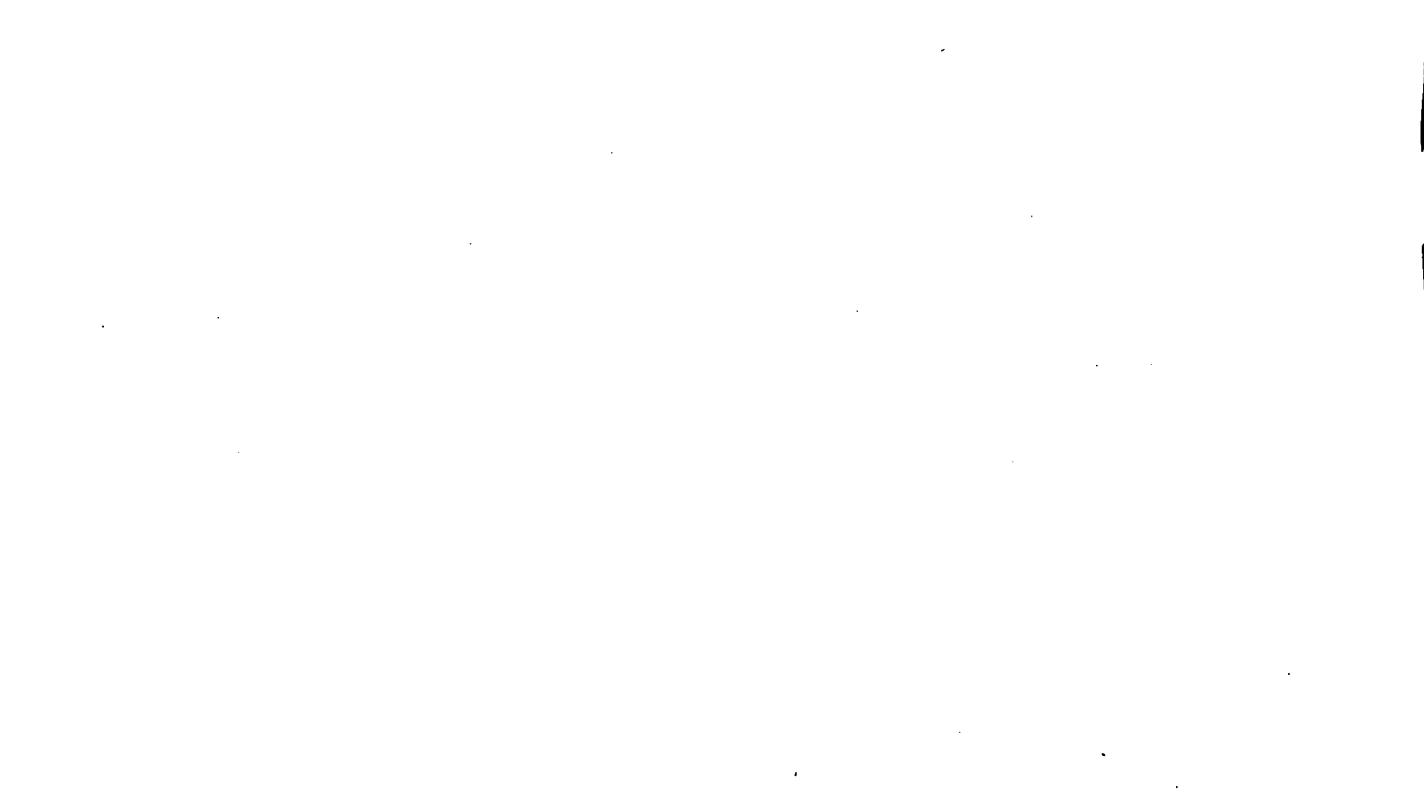


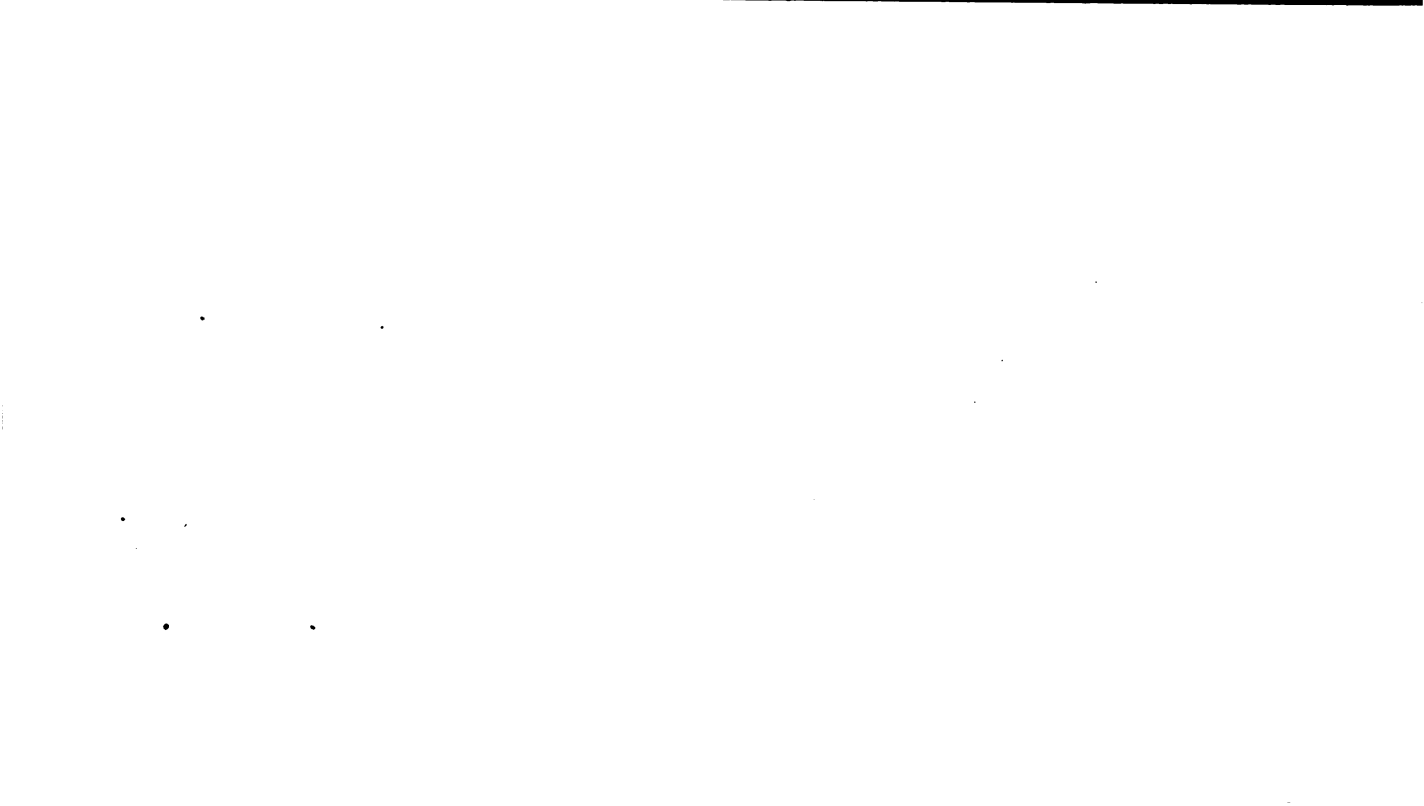










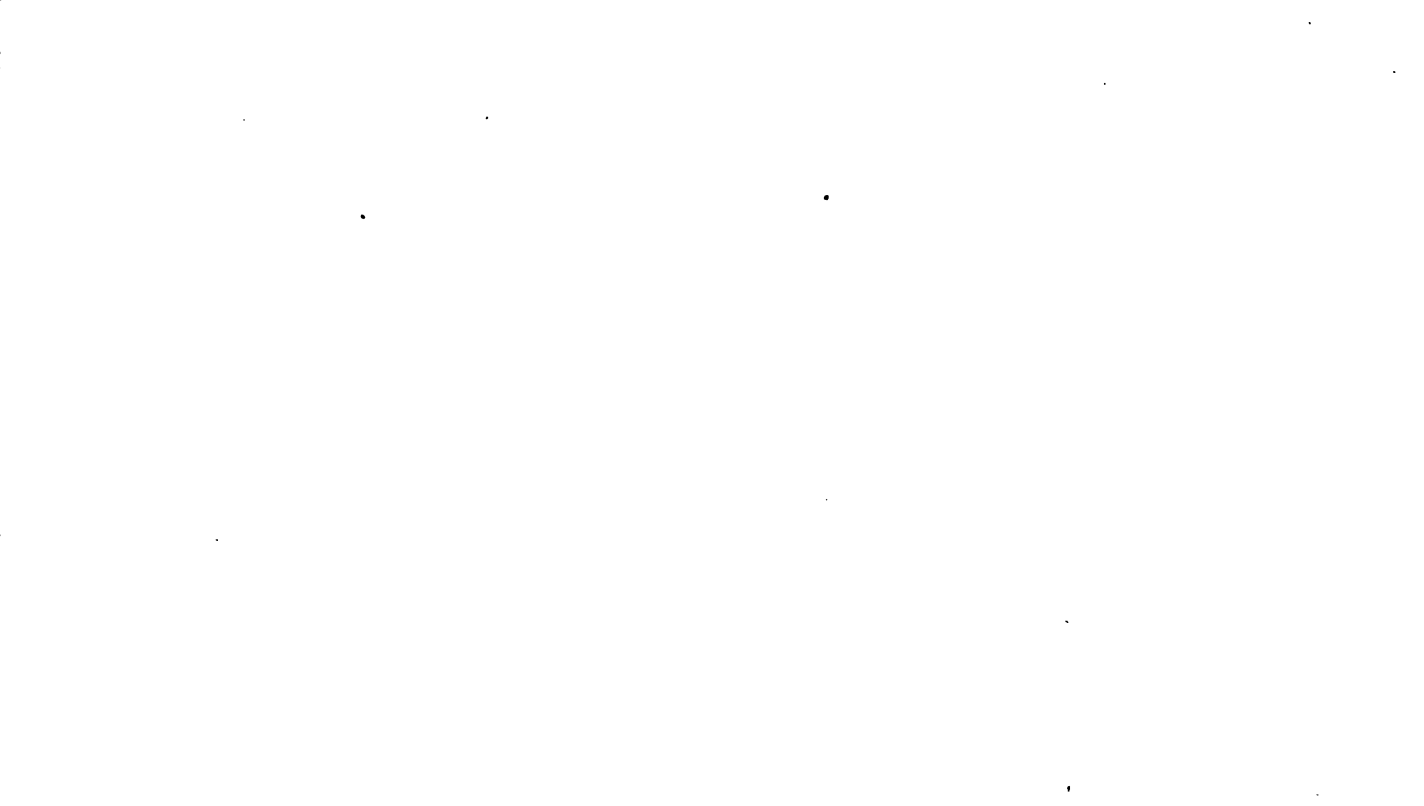


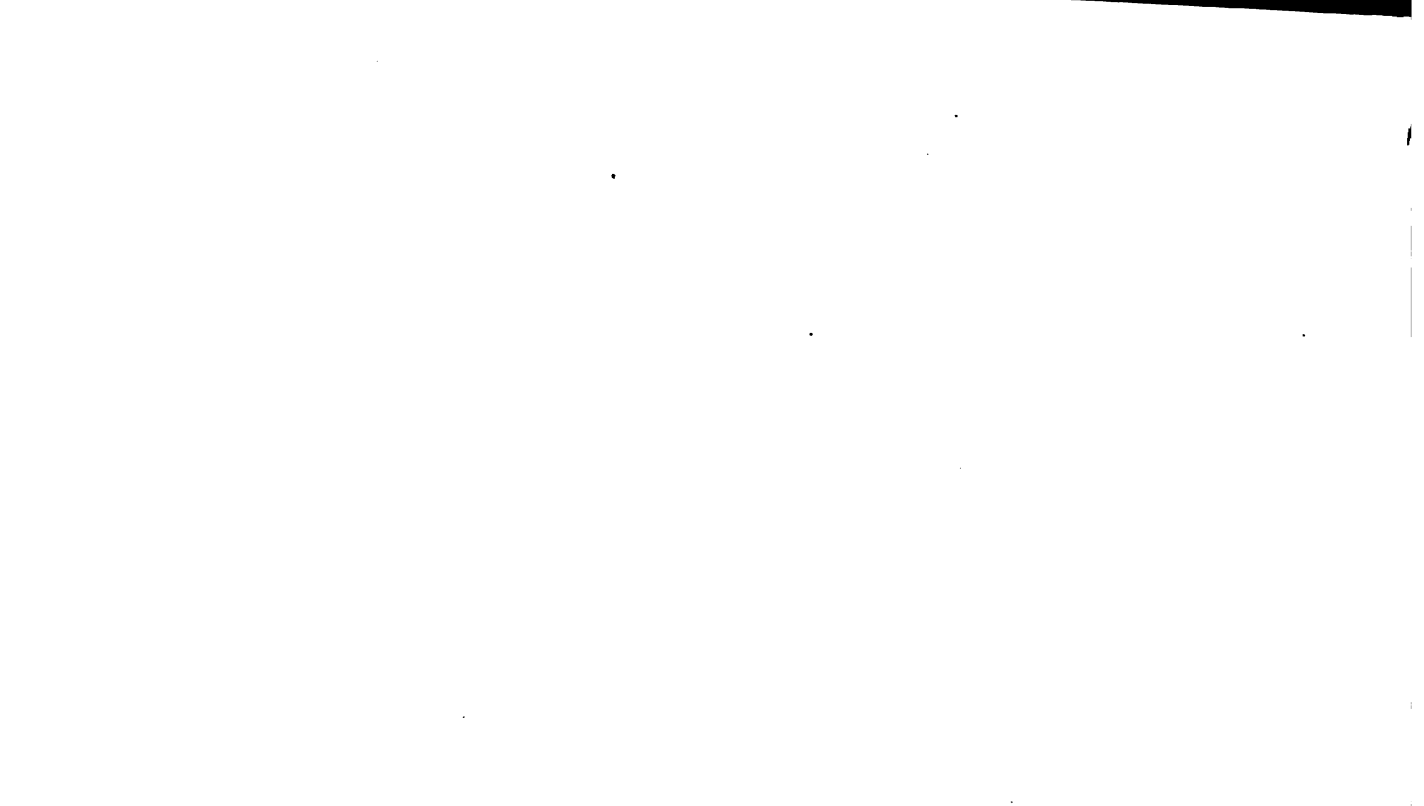
















































UNIVERSITY OF CALIFORNIA LIBRARY
BERKELEY

**THIS BOOK IS DUE ON THE LAST DATE
STAMPED BELOW**

Books not returned on time are subject to a fine of 50c per volume after the third day overdue, increasing to \$1.00 per volume after the sixth day. Books not in demand may be renewed if application is made before expiration of loan period.

NOV 20 1919

YA 66820

T17651
350
103709

